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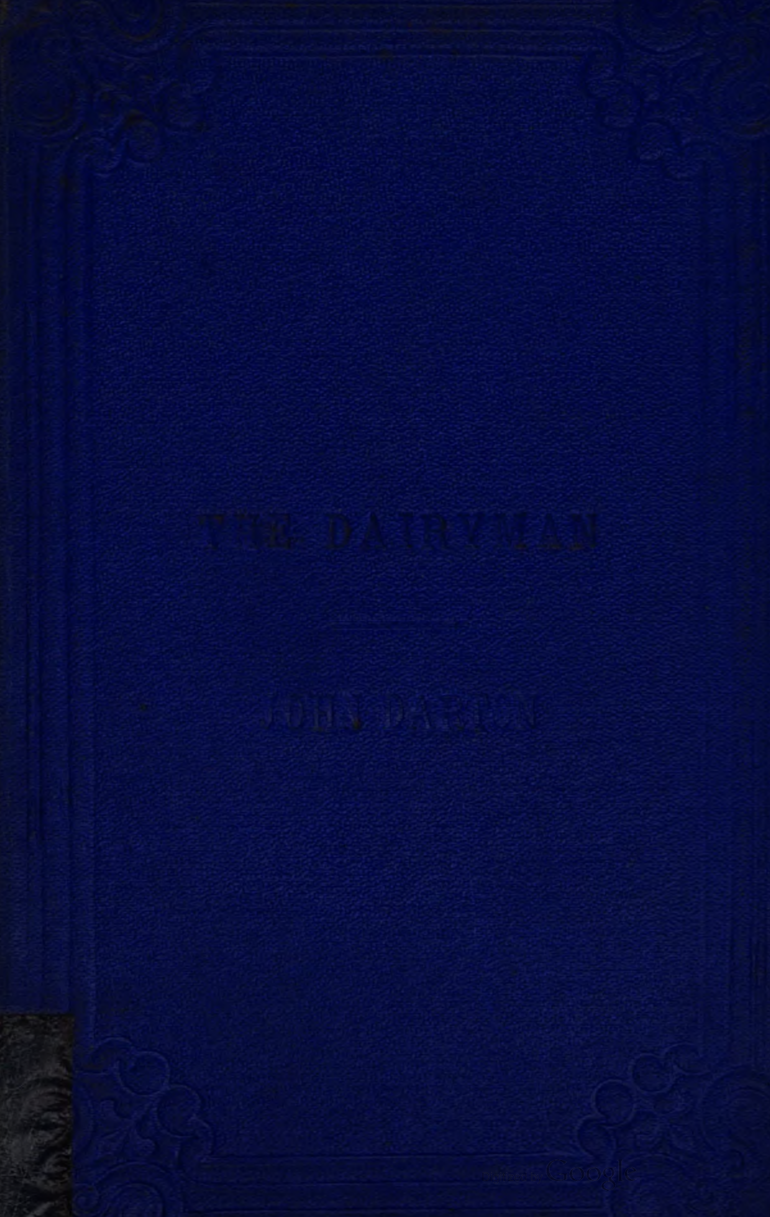

THE DAIRYMAN

JOHN DARTON

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THE DAIRYMAN

A Practical Guide
TO
COW KEEPING
AND THE MAKING OF
BUTTER AND CHEESE.

BY
JOHN DARTON.

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THE DAIRYMAN.

CHAPTER FIRST.

THE COW.

THE BREED OF THE DAIRY COW.

In determining the breed of the dairy cow to be kept, due regard must be paid to considerations connected with the locality in which the dairy is situated, and the purposes for which one is designed—whether for butter and cheese making, or for milk selling alone. Some considerations on this latter point will be found in Chapter Second, where the feeding of the dairy cow is treated of. Although there is a great variety of breeds or so-called breeds of dairy cows, still for all practical purposes the breeds may be classed under four heads—the Ayrshire, the Yorkshire, the Suffolk—these being peculiarly British breeds—to which may be added the Alderney or Channel Island. Where pastures are very rich, and quantity of milk is the object aimed at, the Yorkshire is an excellent cow. It is highly esteemed in the London and other districts where highly forcing foods are given in abundance. The Yorkshire, so called, is not a pure breed, being descended from a cross between the Holderness and the Durham, or the Short-horn. The

Yorkshire yields very large quantities of milk when fed liberally; the Ayrshire is held in high estimation for cheese making; and the Alderney for butter and cream. The Suffolk is well fitted for districts where the pastures are poor; their yield of milk is good, and it is comparatively rich in butter; it is a polled breed.

Some writers classify the breeds of dairy cows under two great heads; first, those which may be called the "pure milking;" and second, the "fattening cow." Under the first head are placed the "Ayrshire" (Scotch) breed, the "Yorkshire," the "Gloucestershire," the "Leicestershire," the "Cheshire," the "Dorsetshire," the "Alderney" (Channel Island), the "Kyloe" (Scotch), and the "Kerry" (Irish). The fattening cows are the "Shorthorn," "Hereford," "Devon," and the "Aberdeen polled." Crosses between one or other of those breeds produce some remarkably fine dairy cows, combining an aptitude for milk producing and also for keeping in good condition. Other writers classify the breeds according to the horns or their absence; as the "long-horns," originally Lancashire, greatly improved by the celebrated breeder, Mr. Bakewell, of Leicestershire, and generally met with in the midland counties of England; the "short-horns," or Durham breed; the "middle-horns," met with in Devonshire, Sussex, Herefordshire, and Gloucestershire; the "polled or hornless" breed, met with in Suffolk and Norfolk, in England, and Galloway and Aberdeenshire, in Scotland. The Alderney, under this system of classification, belongs to the "crumpled horn" breed.

CHOOSING THE COW.

It is not intended here to enter into the vexed question of which is the best cow, pure bred or cross bred; or to say more than we have done in the way of describing varieties. A few general considerations will, however, be useful. And here we would strongly advise the purchaser of dairy cows, that no matter what the breed be he chooses, he should be determined in having the animal the best of its kind or breed which he can obtain. A poor animal will not in any sense pay. It is therefore necessary to know what constitutes a good cow, or technically speaking, what are her "points." In choosing a cow, another thing to be attended to, is her age. Young cows give the best yield, and should always be chosen in preference to old ones. Another point to be attended to, is the choice of an animal which will give us confirmation of a good milker, with a tendency to lay on fat, or keep in good condition. Notwithstanding the opinion of some to the contrary, these characteristics are quite compatible. Some of the crosses recently introduced are very valuable in this respect, yielding a good supply of milk when "in milk," and when "dry" either being in good condition for the butcher, or put into it with comparatively little trouble or expense.

POINTS OF THE COW.

The form, general appearance, and "touch" of the skin, are points to be attended to; and with regard to these, a good idea may be obtained from the following description of a good dairy cow:—

"Head small, long, and narrow towards the muzzle; horns small, clear, bent, and placed at considerable distance from each other; eyes not large, but brisk and lively; neck slender and long, tapering towards the head, with a little loose skin below; shoulders and fore quarters light and thin; hind quarters large and broad; back straight, and joints slack and open; carcass deep in the rib; tail small and long, reaching to the heels; legs small and short, with firm joints; udder square, but a little oblong, stretching forward, thin-skinned and capacious, but not low hung; teats or paps small, pointing outwards, and at a considerable distance from each other; milk-veins capacious and prominent; skin loose, thin, and soft like a glove; hair short, soft, and woolley; general figure, when in flesh, handsome and well-proportioned."

The "milk veins," as they are sometimes called, afford another indication of the character of the milking cow; they are met with between the bearing and the udder; they are not always visible, but their presence is desirable, and may be indicated by pressure. If the veins have a "knotty appearance," this is considered a good point. The other veins to be noticed, are those which run on each side of the animal a little above the udder, from the flank-veins toward the neck. The milk glands are placed in the upper part of the udder, one gland in each quarter. The udder should be large, have a thin soft skin, and the teats should be placed well apart, and the whole of them should be tested to see that each gives milk; as one or more of them may be "blind," indicating a loss of the milk of the quarter of the udder to which they belong. Professor Gamgee places great reliance upon the "net-work of veins seen beneath the skin over the fore-quarters of the udder . . both the veins and the udder itself, and those which pass upwards behind, towards the tail, in fact, over the perineum when large, are sure tests of a competent milker." Another way of ascertaining the probable value of a cow for milking purposes, is the "scutcheon;" which forms the basis of M. Guenon's system; and which the above quoted authority says is the most valuable of all methods to determine the milking qualities of the cow. Space does not permit us giving a description of the "scutcheon" or "escutcheon," further than to state that it is indicated by the form which the hair assumes on the buttocks of the cow, and which grows "in two different directions, one portion pointing upwards, with another part downwards, and thus producing a sort of fringe at the point of juncture. This hair which has an upward tendency, has been termed the escutcheon. The larger the extent of the escutcheon, the greater is the promise of milk, and also of the continuance, even after the cow is in calf." For a full description of the system of M. Guenon, our readers may consult with advantage Professor Gamgee's work, "Dairy Stock: its Selection, Diseases, and Produce." We have said that the dairy cow kept should be young; the age of a cow may be ascertained by the number of rings on the horns, and by the general appearance of these, each ring indicating one year in the age of the cow; the third year's ring is, however, the first that is clearly indicated. The teeth are also another indication of the age, and are more trustworthy than those afforded by the horns, which are often mechanically treated and altered as to lead to false calculations. The permanent teeth are those which give the means of telling the age of the cow, and the epochs through which these pass. The first epoch "consists in the successive eruption of the permanent teeth;" the second being that "in which the incisor teeth change in their wearing aspect; this period extends from five to nine years of age, and annually each succeeding pair is observed worn down." A cow is said to be "full-mouthed," that is, to have its full complement of teeth, at the end of the fourth year.

In the general treatment of the cow, the healthy housing is a matter of the first importance, to which we now therefore direct the attention of the reader.

FEEDING STALLS FOR THE COW.

Stalls are of two kinds, "single" and "double;" the width of a single stall, minimum four feet four inches, maximum five feet. Double stalls for two cows should not be less than nine feet wide, or more than ten feet. The width of single stalls is generally too little, the cow having far too small a space to lie down and be comfortable in. The real point to be thought of is the comfort of the cow, and if this can, as it may be, secured by a few inches additional of width, they should be given. Ground space is not of such a costly nature in the country as in crowded towns, as to justify the crowding together of the animals, merely to save a little extra ground or work. Besides, the main aim or end of the building is, or should be, the comfort of the animals. Stalls are often, indeed we may say in new erections generally, made double, so as to hold two cows. On this point we may quote the authority of Mr Stephens—"A wide single stall is not only useful in supplying the food from the byre, but admits of the cows being more easily and conveniently milked. A double stall is objectionable, for several reasons; a cow is a capricious creature, and not always friendly to her neighbour, and one of them must be bound to the stake on the same side as she is milked from, and to avoid the inconvenience the dairymaid either puts the cow aside nearer her neighbour in the same stall, which may prove unpleasant to both parties, or the cow in the adjoining stall nearer her neighbour, which may prove equally inconvenient. Neither is it a matter of indifference to the cow from which side she is milked, for many will not let down their milk if the milkmaid sits down to the unaccustomed side. The best plan in all respects is, for each cow to have a roomy stall to herself." The flagging or floor of the stall should be continued but a few inches beyond the heel post of the travis, the space between this and the front of the manger being of beaten earth, asphalt, or india-rubber pavement. It is essential that this part of the stall shall be soft, "because cattle in lying down and rising up first kneel upon their fore knees, which will be injured if pressed against any hard substance like stones, and which would always be the case if the causeway were not always covered with litter." The gutter, one foot wide, should have a smooth bottom, and have a gentle fall throughout its length. The centre space—if two ranges of stalls are required in the apartment—may be flagged or asphalted, and have a slight rise in the centre. A water-trough should be supplied to each stall. This may be made of stone or cast-iron, and the bottom should not be level, but should slope from all sides to the centre, at which a plug should be provided, by which the water can be withdrawn from the trough as desired. The plug-hole should communicate with a small drain, or pipe leading to the main drain. An overflow pipe should also be provided. A constant supply of water should be kept up to the troughs, the best authorities agreeing that it is the best and most natural way to allow the animals to drink whenever they may desire to do so. In some farm buildings we have seen self-acting apparatus applied to each trough, by which the water was constantly kept at the same level in the trough. Where water is supplied to the steading at a pressure, the troughs may very easily be filled by means of a flexible hose, terminated by a nozzel, and provided with a stop-cock. This will be also serviceable in washing down the stalls and dunging passages, the water finding its way to the drains through the gratings in the channels or gutters.

THE ARRANGEMENT OF STALLS IN THE COW-HOUSE.

There are several modes of arranging the stalls in a shippon or cow-house. In the old method, and that which is still generally adopted, the manger is placed right against the wall; in the improved and better method, there is a passage, three feet in width, between the wall and the mangers, this space being used as a feeding passage. This plan has several advantages; it keeps the animals from the walls, and by filling the mangers from the feeding passage, the animals are not disturbed—a point of no small importance in the treatment of dairy cows. Between the cows is the gutter, generally a foot in width, and which should be rounded at the bottom and edges; and behind this is the dunging passage; the width of this should not be less than six feet. It is a great mistake to have narrow passages in a cow-house, as they greatly interfere with the cleansing operations. The total width of a cow-house with a single row of stalls should not be less than 18 feet, which will be taken up as follows: width of feeding passage at the back wall, 3 feet; width of manger, 2 feet; distance from front of manger to end post of travis—a division between the stalls—4 feet; distance from end of travis to edge of gutter, 2 feet; width of gutter, 9 inches; width of dunging passage, 6 feet. The height from the floor to the under side of tie-beams of the roof, 9 feet; the rise of the roof in height of the king post, 6 feet.

Where many cows are kept, the length of the house might be too great if a single row of stalls were adopted. The arrangement of a double row of stalls should then be availed of. There are two methods of arranging double-rowed stalls; the first being merely a repeat of the arrangement of single row as described above, one row to each side of the house, with the dunging passage in the centre, bounded on each side by the gutter; the feeding passages being at the side, alongside the walls. The second arrangement is precisely the reverse of this, the feeding passage occupying the centre of the house, the stalls being placed right and left of this; then the gutters and the dunging passages on each side of the house, the wall forming the boundary on each side. The travis divisions between the stalls may be made either of stone or wood, the latter being certainly the most comfortably feeling material for the cows, being warmer and much less liable to damp than stone. The length of a travis boundary should not exceed six feet from the back line of the mangers. The manger should rest upon a brick or stone foundation, and should not be too low, not less than eighteen inches from the ground level. The manger, if three feet long, one foot deep, ten inches in width at bottom, increasing to fifteen inches at top, will be of ample dimensions. If the cow-house is arranged with a feeding passage at head of stalls, as already described, it will conduce to the comfort and quiet of the animals if it is divided off from the stalls by a wooden partition, holes being left in this through which the food of the cows is placed in the mangers, these apertures being shut up, when not in use, by sliding doors. There are various modes of tyeing up cows in the stalls; but the one adopted will be best which will give the animal full liberty to turn round and lick herself.

VENTILATION OF THE COW-HOUSE.

A very important part of the construction of the cow-house, is the ventilating apparatus; for a proper supply of pure air is essential to the health of the animals. To secure this, two things must be attended to; first, the supply of fresh air; and second, the withdrawal of the foul or used air. These two must work together, or the building will not be ventilated. We do not advocate the application of complicated apparatus for ventilation of cow-houses, if the roof be an open one, that is, the timbers exposed without the intervention of a ceiling; the ordinary louvre boarded openings in the roof will suffice to withdraw the foul air; although it will be better, and will not add much to the expense, if valves or moveable flaps of wood be applied to the interior opening of the louvre box, the opening and shutting of the valves being done by a simple arrangement of pulleys and cord, the cord being taken down to the interior of the building and fastened at some point within easy reach. The fresh air may be admitted by means of the windows, the upper halves of which should be made to swivel on a central pin, so that they may be set at any desired angle, and thus admit the air from the outside; or the upper half may be hinged at its lower edge, and provided with cord, pulley, and staple, so that it may be opened to any extent desired, and retained at the point. This arrangement will be better than swivelling the upper half of the window at the centre; for the fresh air will be thrown in the first place upwards, and the down draughts will be avoided. In addition to a supply of air by the windows as now described, perforated iron grids should be fixed at intervals in the walls opposite the feeding passages, at or near the level of the floor.

Next in importance to a supply of fresh air, is the keeping of the interior of the cow-house in a state of the most scrupulous cleanliness. The litter should be carefully attended to, and not allowed to lie long with its accumulated filth; the floors should be kept very clean, as also the racks and the mangers. All these points must be attended to, if the health and comfort of the animals are desired; and if the cows are not healthy and comfortable, they will not pay.

THE GENERAL TREATMENT OF THE COW.

Having briefly discussed the cow, its breed, choice, and its housing, we now come to the important point of its general management. Much of the success of this will depend obviously upon the kind, quality, and quantity of the food given to the animals, and also upon the way in which it is given; but these points are so important, and demand more than a mere passing treatment, that we shall discuss them in a separate chapter (the third,) to which therefore we refer the reader; passing on, meanwhile, to the brief consideration of other points.

And first in importance, is the kind and gentle treatment of the cows. The influence of harsh treatment on the yield of milk is very marked, both as regards the loss of the quantity, and the deterioration of the quality. So that, apart from motives of humanity, those of pecuniary interest urge upon the dairyman, the importance not only of himself being kind to the cows intrusted to his care, but to know that those in his employ are equally so. Harsh treatment, says an authority, exerts a very injurious action upon the milk, rendering it less buttery and more liable to acidity. Respiration is a species of combustion. At every breath we inhale oxygen of the atmosphere, which unites with and consumes the fatty portion of the food. When cows are worried, or driven too rapidly, they breathe more frequently, while more oxygen and more of the buttery portion of their food is consumed, leaving less to be converted into butyraceous milk. So that science as well as humanity combine to impress upon the minds of those who keep cows, that it is for their interest that they should treat them gently.

But if gentleness be necessary as a general rule, it is doubly so in the milking of the cow. It is not every one who knows how to milk a cow, as it should be milked. The following remarks upon the subject will be useful here :—"We object to milking in open yards, where the cows are liable to interruption by each other, or by storms, and often becoming restive by accidents not altogether under the control of their milkers. After long practice in the management of cows for dairy purposes, and their keeping arranged into a regular system, we are satisfied of the decided advantage of milking them in all seasons, under shelter, and in the stalls which, during the winter months, they regularly occupy. Thus we say in a well regulated dairy, cows, in every season, should be driven into their stables or sheds, and secured in stalls by ties, chains, or stanchions, for milking. They are thus under control, and every animal is secure from injury or annoyance by her neighbours. Each milker should be furnished with a stool for sitting on. A bucket of water and a cloth should be at hand, to either wash, wipe, or otherwise clean the udder and teats before commencing the work, if necessary. The cows may be fed just before or after milking, as the season of the year, or the habit of the dairy may be; but the habit, whichever way, should be regular always. No noise or loud talking should be indulged in among the milkers. No scolding, fretting, thumping with stools, or otherwise; and if in refractory cases, some discipline of a restive cow should be needed, none other than a light switch should be used for punishment. Mild treatment, and soothing terms in most cases, are more effectual than harshness in making cows gentle. They should learn to regard their milkers and keepers as friends, to love their presence and confide in their kindness.

"The milk should be drawn rapidly, and with both hands, in as cleanly a manner as possible. Sometimes, if the milker be musically inclined, the cow is soothed and entertained by the droning of a low-voiced song. We have seen unquiet and restive cows stand quite still while the milker hummed his tune, though without it she would be timid and uneasy—not that it is necessary in usual cases, but we have known such. One person will milk eight to twelve, and sometimes more, cows at a time, and the times of milking should not occupy more than an hour each. There is a great sleight in this work, and some will milk a dozen cows better, and in less time than another will six. The cows should be taken in regular turn, with the same milkers to the same cows as nearly as possible, they both becoming better used to each other. The times should be as equally divided in the twenty-four hours of the day as possible, and be the division of the times as it may, it should be regular, that the udders be not subject to undue distension. System, order, and regularity in milking has much to do with equable flows of milk, and cows habituated to certain times, yield their messes more regularly in quantity then when irregularly milked."

The advantages of a generally maintained system of treating the cows gently and kindly, will not be more obvious at any period of the cow's existence than at that when she is about to calve. This period, under any circumstances, is a critical one, and harsh treatment will render it more so, and will often, as it does, result in the death of the animal; or if cruelly treated at an earlier period of its pregnancy, abortion may follow. Careful and kind attention must therefore be given to the cow during her pregnancy, and especially, as stated above, at or about the period when she is about to calve. And here a few words may be said as to the "drying" of the cow. Some milk their cows up to within a week or two of their calving. That this is wrong will be obvious, when we consider the drain that is upon the system in maintaining the calf which she carries. In place, therefore, of withdrawing that which goes to nourish the calf and to keep her own frame in good condition, not only should milking cease at least six or eight weeks before the expected period of calving, but she should be supplied with abundance of good and nourishing food. This good supply of food should indeed be attended to during the whole period that the cow is in calf, so as to keep her in good condition, but not fat. If too fat, she is very liable to be attacked with milk fever after calving. In drying a cow, when she is milked the milk should be drawn thoroughly off. Some only partially draw the milk; but this is apt to cause inflammation of the udder, through the milk left becoming thick and putrid. In drying, the udder should be examined from time to time.

The following remarks give some excellent advice upon the important point of drying cows:—"No matter what quantity of milk the cow is yielding, stop at once, not by milking every second or third day, but for ten, twelve, or fourteen days; it is only by refusing to take away the milk that it ceases to be formed. This is the whole secret. But attention must be given to prevent injury to the animal. If the quantity of milk be large, the udder should be wet or bathed with cold water, and rubbed frequently for the first four days to keep down inflammation. On the fourth day, four quarts, or, if the cow be large, five, or even six quarts of blood should be taken from the neck. Bleeding before hefting, or before inflammation has set in, is worse than useless. On the fifth or sixth day, the udder will begin to soften and gradually subside, but don't milk for ten days at least; by that time, milk will almost have disappeared without any bad consequence resulting. I have known some cases where after such treatment the animal has been put to grass at May, after one milking only, and not again touched until brought in for slaughter at the end of the season. The above is the treatment of cows in the house before being sent to grass; but on pasture the bathing and rubbing may be dispensed with—the grass being a substitute for the cold bath—the friction of the cow's thighs in walking being better than hand-rubbing to the udder. There is sometimes trouble with cows that run out their milk. A small gutta percha band on the teat or teats will put a stop to it. To prevent the band becoming embedded and difficult to remove, place a small piece of calico, or thin, soft leather on the teat, below the band, fixing on the band a small ring of cord to hang out, so that a ready hold may be got, and the point of a small knife applied to the band where it cannot be otherwise got off. No necessity to reduce the feeding in the slightest degree."

The state of the bowels should be carefully attended to during the last fortnight of pregnancy of the cow. Constipation is one of the great causes of milk fever; and to prevent this, the simplest, the safest, and we believe the best plan, is to give the cow a pretty liberal supply of oil-cake, or of other food having a laxative tendency. Feeding with large supplies of cold roots should be avoided, an occasional warmish mash being given with great advantage. As the period of parturition approaches, the cow should be very carefully attended to, and should be placed apart from other cows, if possible, supplied with comfortable bedding, and fed sparingly during the last twelve hours. The water supplied to the animal should be of pure quality. And we would again here insist upon the most rigorous attention being paid by the owner to secure the most kind and gentle treatment of the animal on the part of the attendants, if difficult labour is to be avoided. Although during the latter stages of gestation the animal should be kept as quiet as possible, exercise is required; this, however, should be moderate,. and on no account taken during cold, rainy, and tempestuous weather. To expose animals in this condition, as some do too often expose them, to cold and rain, and in dirty muddy yards or fields, is as costly as it is cruel. Kindness, like civility, costs little, but is worth much.

CHAPTER SECOND.

THE REARING OF CALVES.

There is very great diversity of opinion as to the best mode of rearing calves. Some hold that the best way is to allow the mother to bring up its own calf; others hold, on the contrary, that the best way is to bring it up by hand. Again, there is great diversity of opinion as to the kind of food to be given to calves when the hand feeding system is adopted; some advocating the giving of pure milk alone, others the giving it with water; some use the milk with artificial foods, as linseed; others dispense with the milk altogether, and make up a food for the calf composed entirely of water and artificial foods or farm products. The most perfect food unquestionably is milk. Hadlein shows its constituents to be as follows:—

Water	87.24
Butter	3.30
Milk-sugar	4.40
Casein	4.80
Phosphates of iron, magnesia, and lime	3.35
Chloride of Potassium and Sodium	0.17
Soda combined with Casein	0.04

This examination, as we find remarked in the pages of "The Farmer," of the milk of the cow, shows that it yields all the constituents necessary to build up the frame and nourish the system of the calf; yet, nevertheless, we find in practice that, although this is the case, the cow is not always in the condition to supply the milk which the calf requires, nor in such a state of health as to admit of the calf suckling her, even in cases where milk is abundant enough. But at this point we find strong evidence in favour of milk of good quality being the best food with which to feed the calf, or where the calf is, or has, to be fed by hand. For, in the butter and the milk-sugar which we find the milk to contain, we have the constituents necessary to keep up the warmth of the system, and to yield the fat which it requires. In the casein, we have an albuminised constituent yielding flesh and the tissues; in the mineral ingredients, the phosphates of lime, magnesia and iron; and in the potass and the soda, the constituents necessary to maintain the growth of the bone system and the blood.

NATURAL METHOD OF REARING CALVES.

Milk, then, is the only food we have at command which contains all the elements of life required, and in precisely the best proportion—proportions which no artificial food can possible give, however carefully that food may be made, and however closely the milk, as a standard, may be followed. Let us now glance briefly at the two methods of giving this milk—the "perfect food"—to the calves; first, by allowing the calf to suckle the mother, and second, by giving the milk from the pail by hand. By allowing *the calf to suckle its mother* from the commencement of its existence, it has all the advantages of partaking of the biestings, or first milk yielded by the cow after calving. This, as is well known, is—if not different in constituents—certainly very different in character from the ordinary milk, and is known to possess certain qualities which have a good effect upon the bowels of the calf when partaking of it. Further, the calf after its birth is covered with a wet slimy substance, which the cow eagerly employs itself in licking off from the whole surface of the calf. Now this process has a threefold benefit attached to it. In the first place; it soothes the cow, and keeps her in a quiescent state—quiet is of great importance in aiding the recovery of her strength; in the second place, the calf is benefited by it, for the licking tends to put the action of the skin into healthy exercise; and in the third place, the substance which the cow licks from the calf's body, passed into her own system, exercises a most beneficial influence upon the bowels. Moreover, another advantage is, that the udder of the cow is kept in a healthy condition by the action of the suckling of the calf. We thus see, what indeed is obvious enough, if we would only consider that all natural processes are well designed, that several healthy results arise from this arrangement. Here some may say that the carrying out of, or rather the permitting of these, can still be secured, by allowing the mother to lick the calf, and then to be taken from her; no doubt two out of the three advantages would be gained, but the third would be lost, as the cow, in place of being soothed and quieted, would be disturbed; for after, even for a short time, being accustomed to her calf, she will find its absence when taken from her. Again, it may be said that the calf must not necessarily be deprived of the biestings, or first milk drawn from the cow, for it may be drawn by hand, and given to the calf in the usual way by hand also. But this brings us to the disadvantage of hand feeding—a disadvantage resulting from physiological facts which we cannot get rid of. It is well known that the cow has several stomachs, each of which has its own function to fulfil. These are used by the animal after it reaches a certain age, but they are not all used by the calf when it is very young. When very young, nature designs that it should partake of its food at frequent intervals, but in small quantities at each interval; this is secured by the natural mode of suckling. But when fed by hand, the calf is apt to take more, and to get more—through the carelessness or the ignorance of attendants—than the food-digesting stomach can easily assimilate or take up; the result is, that it passes into the rumen, which, being thus prematurely set in action, either weakens the animal or induces disease. This also shows the danger of the practice of giving very young calves solid food. So much, then, for the natural mode of rearing calves.

ARTIFICIAL METHOD OF REARING CALVES.

We now come to consider the various modes substituted for it. One reason brought forward—even by those who approve, according to theory, of the natural mode—for dispensing with it is, that, where calves show a greater precocity for feeding and making rapid progress, than by the system of feeding by the hand, advantages may be taken to increase the food given in proportion. At the same time, if the cow be well supplied with milk, it is apparently a reasonable supposition that the calf, having this feeding precocity, will feel the calls of hunger correspondingly, and the more frequently help itself.

And here we would draw attention to the importance of carrying out the operations of hand feeding with care. For example, the calf should be trained to take its food slowly; bad results will assuredly follow upon allowing the calf to gulp down quickly its allotted portion of food. The more closely the manner in which it takes its food approaches the gradual process of suckling, the better; the attendant, on the calf being fed, especially at the earliest and earlier stages of its existence, should be at some pains to make the animal draw the milk through his hand, so that it may be forced, as it were, to take the food slowly. Calves are apt to drink too fast, and when this becomes a habit, it tells upon their condition. All this care involves time; but if it is not worth giving time to careful feeding of animals, which may ultimately become very valuable animals, feeding had better not be undertaken at all; in no department of farming is the adage so applicable, "What is worth doing at all is worth doing well," as in the department now under consideration. Some feeders use milk alone for the first four weeks; the quantities being, according to one authority, four quarts per day during the first week, given at two meals; five or six quarts per day, in two meals, during the second and third weeks; six or seven quarts a day during the fourth week. After this, artificial foods are added. Some, again, begin with a little artificial food with the milk, as oil-cake dissolved in it. In giving the milk, care should be taken to have it warmed to about the same temperature as the mother's milk; and, as before stated, it should be so given that the calf takes it gently. About the fourth or fifth week, a little solid food may be given, but it should be of first-rate quality. A few slices of turnips may be given them, also, from time to time, and a few nuts of oil-cake to nibble at will be well repaid in the increased good condition of the animals. A little meal should be added to the milk during the fifth, sixth, and seventh weeks. As the quantity of solid food is increased, the milk or liquid food is decreased. A good deal of care and trouble is sometimes involved at the period when calves begin to eat solid food, some taking to it with great difficulty; others, again, take kindly and quickly to it. Some have quite a morbid desire to eat, and will eat almost anything that comes within their reach, and can be eaten. Straw in the long condition, they should be carefully kept from eating; it often induces internal complaints of a dangerous character. If they thus show any tendency to eat their litter, they should be muzzled, in order to prevent them doing so. This precaution, however, applies only to calves in the first ten or twelve days of their existence, before the chewing of the cud begins, after which they may be unmuzzled. When new milk is scarce, the young calves may have skim milk thickened with linseed or wheat meal.

GENERAL TREATMENT OF CALVES.

Great care should be taken to keep the animals clean. Let them be well curry-combed, or at all events carefully rubbed down with straw. Nothing tends so well to keep them from lice, as attention to the state of the skin by careful and frequent rubbing. Sometimes they are so troubled with vermin, that washing has to be resorted to; soft soap is the best substance to use in this case, but care should be taken to wash it well off, as if any is left it is apt to irritate the skin. It is scarcely necessary to say, that after washing they should be rubbed dry, especially in wintry weather. Exposure to cold, after washing, with wet hides, would be apt to bring on disease. The same may be said of exposure to wintry weather under any circumstances. It is a mistaken policy to turn calves out too soon in cold weather. The state of the litter should be seen to. A great deal of disease is caused by the filthy condition in which calves are often littered. Let the straw be abundant in quantity and sweet in quality. Attention to these points of warmth and cleanliness both of the body and of the place in which it is kept, is of essential importance if the calves are to be kept in the best condition. An equable temperature is necessary to all feeding and growing animals, and this should be secured as efficiently as possible. Attention should also be given to the way in which the animals are housed. By far the best way is to give each calf a separate pen or crib, provided with manger and hay-rack. If the expense of this be objected to, the calves may be tied up by loose leather straps to posts provided with swivel irons to allow of free action. The calves should not be allowed to herd loosely together.

Gathering up the result of the various experiences at command on the subject of rearing calves, the weight of evidence is clearly on the side of the plan of rearing by hand, of the different modes of carrying out of which we have given descriptions. But, while the rearing of calves by hand is thus preferred by the majority of practitioners, it is only right to name, that, with few exceptions, all are agreed upon the necessity of allowing the calf to suckle the mother for a period more or less brief after its birth, before it is put upon the hand rearing.

If the calves are to be reared for breeding purposes, then the hand rearing must not be thought of, the calves being brought up by the mother. Castration should be performed in the case of the bull calves before they are weaned, say from six to twelve weeks old; and spaying in the case of the heifer calves before they are three months old. Calf pens should be provided, five feet square, opening into yards; each pen should have a manger, hay rack, and water trough; a lump of rock salt being placed in the manger for the calf to lick at.

CHAPTER THIRD.

THE FEEDING OF COWS.

GENERAL CONSIDERATIONS IN THE ESTABLISHMENT OF A DAIRY.

If the milk is to be sold wholly off, and this is more likely to be done in the immediate neighbourhood of a town, then the feeding is different in mode and quality, than when the milk is to be made into butter or cheese. And, so far as town or suburban dairies are concerned, it happens favorably enough, that the kinds of food calculated to increase the flow and yield of milk are easily obtained, or at least, more easily than in the country. Thus, there is generally a large supply of distillers' "wash" or "dreg," and of distillers' or brewers' grains, or "draff," as it is termed in the North. But it may happen, that however much inclined the farmer may be to dispose of the whole milk, or perhaps, on the contrary, to make the milk into butter, that the peculiarities of the produce grown upon his farm, may compel him to adopt that mode to which we may not be inclined, or may think is the least likely to pay. And this difference in the feeding, results of different foods—or rather the results of given foods—is much more marked than is sometimes supposed. Thus the produce of some farms, or of some fields on a farm, will be found better calculated to give more of one product than of another; as, for example, more butter will be yielded in one case than in another. Circumstances such as these, will therefore determine the farmer what kind or mode of dairying he is to adopt. Further, the mere mode of giving the food has an influence upon the products; thus cooked food has a marked influence as compared with the same food given raw, and so also of the way in which mixtures of food are made. Thus, a distinct difference will likely be observable, if, for example, meal is used in conjunction with cooked roots and chaff, the meal be given boiled at the same time, and with the roots, and when the roots and chaff are first cooked, and then mixed with them in the dry or powdered condition. Here, all these and other circumstances are modified, according to circumstances of locality, soil, &c.; but we advert to them, to point out the importance of each farmer thinking for himself, and endeavouring, as the result of that thought, to find out, by careful experiment, what is really best for him to do under the circumstances in which he is placed.

FOODS USED AND MODES OF FEEDING ADOPTED IN WINTER PRACTICE, OR HOUSE FEEDING.

Where milk is alone required, and where quantity is the point aimed at, then food of a watery description will be the best. The following has been tried and recommended: 6 gallons of water (the quantities named are for each cow in a day), 1½oz. of salt, 17oz. of mixed meal, 17oz. of grain dust, 3lb. 3oz. of rape cake, 19oz. of linseed meal, 27lb. of beet root or mangold, 55lb. of turnips. These were given in the form of cooked mashes; while a feed of dry food was made up of 11lb. 3oz. of mangold, ½lb. of linseed meal, 13lb. 3oz. of chopped straw, and 4½lb. of hay. Turnips generally are the staple food of dairy cows; but there can be no doubt that much advantage will be obtained by lessening, to a certain extent, the turnips, and increasing or adding other substances. It is a popular fallacy to suppose that a cow in a poor condition, gives a greater flow of milk than one in good condition; this is obvious, when we consider that the animal necessities will draw largely from the food to maintain the waste of tissues. The highest authorities, on the contrary, say that the true system is to keep the body in such a good state, that there will be no drain upon the milk food, to call it; but that it will go almost entirely to the production of milk. Hence, it follows, that the point to be aimed at is, that the food, *plus*, that required to keep the animal in fair condition, or, in other words, the food upon which reliance is placed to yield milk, will be the best calculated for this purpose. The question, then, which is the best milk producing food? But on this, as on other points of agricultural practice, we find a wondrous diversity of opinion, one saying that one food, the other, that another food is best. Where doctors differ, who can decide; and it certainly brings up the reflection, that it is, in the best interests of practical agriculture, a vast pity that one or other of our agricultural societies, do not take up the question, experiment upon it, and give some authoritative statement thereon.

Some say that turnips, almost exclusively, with only a little hay, is the best feeding; others say that these alone without any other substances, will not do. These other substances are bean-meal, pease-meal, oatmeal, Indian corn, and bran. Oatmeal is not by any means frequently used, but those who have tried it speak most highly of it, while others place far above it in value Indian corn, meal, and bran.

Rye, as a feeding material for cows, is almost never used with us; indeed, it is, as our readers know, a crop seldom raised, yet those who have used it speak most highly of it. If it is so valuable, there are many farm patches of poor land, which might be very profitably used for growing rye.

In many towns a large supply of brewers' grains can be obtained for feeding purposes; in conjunction with other food, they are very valuable. The following details of an experiment made by Mr. Struckmann, in Germany, and as quoted by Dr. Voëlcker, the eminent agricultural chemist, will be of service:—The food which produced the most milk was, 5½ lbs. of rape-cake, 36 lbs. of mangold, and 25 lbs. of oat straw; 1 lb. of rapecake produced, on an average 1½ lbs. of milk, and 1 lb. of brewers' grains produced about ¼ lb. of milk. Thus, 1 lb. of rapecake is equal to 4 lbs. of brewers' grain in its milk-producing powers. And lastly—which is a note-worthy point—that while the milk produced by the rape-cake was richer in butter, the butter produced by the grains was more delicate in flavour.

And this latter point brings up also the question of fermented food; this being made up of finely cut straw, of good quality, mixed with various feeding materials, some of which are liquid, and allowed to lie long enough till fermentation has been established. From what some authorities claim for this, we believe that more can be done by the aid of the system, in economising food than has hitherto been done.

We now gather from various sources, a few modes of feeding which have been adopted with success, as supplementary to those we have already given. Mr. Horsfall, the great authority in dairy management, gives the following explanation of his mode :—"My food for milk cows, after having undergone various modifications, has for two seasons consisted of rape cake 5lb., and bran 2lb., *for each cow*, mixed with a sufficient quantity of bean straw, oat straw, and shells of oats, in equal proportions—to supply them three times a-day with as much as they will eat. The whole of the materials are moistened, and blended together; and, after being well steamed, are given to the animals in a warm state. The attendant is allowed 1lb. to 1½lb. per cow, according to circumstances, of bean meal, which he is charged to give to each cow in proportion to the yield of milk, those in full milk getting 2lb. each per day, others but little; it is dry, and mixed with the steamed food on its being dealt out separately. When this is eaten up, green food is given, consisting of cabbages from October to December, khol rabi till February, and mangold till grass time, with a view to nicety of flavour. I limit the supply of green food to 30 or 35lb. per day for each. After each feed 4lb. of meadow hay, or 12lb. per day, is given to each cow. They are allowed water twice a-day to the extent they will drink."

The object Mr. Horsfall had in view, was the double one of maintaining the supply of rich milk for the making of butter, and of keeping the animal in good condition. Feeders know well that in practice cows which yield milk liberally, lose condition; but by adopting a method, such as we above quoted, the two ends may be secured. Mr. Horsfall is of opinion, that the albuminous compounds of food are essential elements in the food of milk cows; and, in opposition to many authorities, shews that these constituents have a "more especial value for the production of milk than for fattening or beef making." Rape cake is admitted to be one of the best foods for dairy cows; but the worst feature connected with its use is, that the animals dislike it, from its rank condition as compared with oil cake. But by boiling it along with the other food, or by pouring boiling water over it before mixing it with the other food, this rank condition is greatly got rid of.

It is a good plan to take up the cows as soon as the nights become cold—say the middle of October—as the white frosts which occur about that time cause them to run off their milk. They are turned out during the day till the middle of November, if the weather keep fine. From that period till May-day, they are kept entirely in the house, except being turned out a few minutes every afternoon to water. They are milked at half-past five o'clock, morning and evening. As soon as the man who feeds them comes in the morning, the dung is all removed, and each cow has a feed of 28lb. of roots. At 7 A.M., 7lb. of chopped hay; 9 A.M., a pail of water, with ½lb. of bean-meal stirred into it; 10 A.M., 2lb. of linseed-cake; 1 P.M., 7lb. of chopped hay; 2 P.M., turned out to water, and then 2lb. of linseed-cake; 5 P.M., 28lb. of roots; 8 P.M., 7lb. of chopped hay.

On this system of management five cows produced, in seven weeks, from the 25th of March to the 10th of May, 191 rolls of butter, 24 oz. to the roll, equal to about 254lb., 16 oz. to the lb. To this duly be added 154 quarts of new milk, and 42 quarts of cream, consumed in the house. The milk was not regularly measured, but averaged about 60 quarts per day.

Another method is thus detailed:—At 6½ A.M., 12lb. of hay; 9 A.M., 15lb. of mangolds, cut fine, and mixed with 3½lb. of straw chaff, and 1lb. of hay chaff; 11½ A.M., 4lb. of rape cake; 3½ P.M., 15lb. of mangolds, cut fine, and mixed with 3½lb. of straw chaff, and 1lb. of hay chaff; 5 P.M., 12lb. of hay.

COOKING OF FOOD, ETC. ETC.

But the kinds or qualities of the food, and the modes of giving them, are not the only points which affect their value as milk producing elements; there are other points bearing upon this. Thus, what effect has food given warm as compared with the same food given cold on the milk producing powers of cows? This is one of the questions which yet remain to be answered in a definite way; if, indeed, experience will show that it can be answered definitely. At least, we can only say generally, that food given warm produces more milk than when cold. This, however, holds good more particularly in winter, but then again, it does not hold good of all kinds of food. Thus swedes make a good mash along with other substances, and are economically thus used. This is not the case, however, with mangolds and cabbages, which should both be given to the animal in their natural state. This is specially true of the cabbage. Some cut or slice this before giving it to the animal. We do not advise this to be done; on the contrary, we say, give the animal the cabbages whole. There is something particularly pleasing apparently to a cow to tear away at, and bury her nose in the heart of a great drumhead cabbage. There is scarcely any green food so grateful to cows as cabbages, and scarcely any which has such a beneficial effect upon the increased production of milk as this. But, we maintain it should never be made to form part of a warm mash. Some say the same thing of hay, which is apparently the most grateful to the animal in its natural state.

Straw, on the contrary, will be best given when cut by machine, and made to form part of the mash. Oil-cake is generally given in its natural condition, but it forms a capital addition to warm food. It is essential to use rape cake in this way, inasmuch as it has naturally a pungency which the animals do not like, and which pungency is overcome by pouring boiling water on it. Thin mashes, or rather drinks made of bran and given warm, stimulate the flow of milk to a great degree. To keep up the condition of the animal while under these drinks, good solid food should be carefully given, this being formed of the usual kinds, as oats, beans, barley, and oil-cake. These, if given dry, should be crushed, and in the form of meal, all carefully mixed together. If given warm, water should be added to give the necessary degree of thinness. One good effect of the food in which rape cake is present, given in conjunction with the thin bran drinks, is, that not only is the yield of milk increased, but for butter producing purposes it is very valuable. A good substitute for bran in the thin drink is brewers' grains, which are much more economically used in this way than when given cold. If potatoes are plentiful, they form a capital food for dairy cows, where the object is a large yield of milk. Perhaps the best way to use potatoes is to boil them thoroughly, and mix them with the bran drink, squeezing them well through the hand, so as to incorporate them with the liquid. In these drinks it will be advisable to put a sprinkling of some meal, as oats or beans.

We have only confined our remarks to the usual, or what may be called the natural foods, at the disposal of the dairyman; but a word or two, if only as a suggestive hint, may be given on the use of condiments. Whatever may be said of these—and a good deal *pro* and *con* has been said upon them—there is one condiment, which in greater or less quantity, should never be omitted in dairy cow food, namely, the commonest of all condiments, salt. It is surprising to what an extent the value of this, as an ingredient in cattle food, has been overlooked. But there can be no doubt whatever, that where judiciously given, it exercises a most beneficial influence upon the health of stock of all kinds; and as far as regards the liking the animals have for it, to those who doubt it, all we say is, "try it." As regards the use of other condiments, of which a large number are at the command of the dairyman, we say this, and that notwithstanding all that has been said against them by various authorities, that we believe some of them can be used with eminently good effect, both as regards the health and condition of the animal, as well as the influence they have upon the yield of milk. Let those of our readers who smile at the talk of "condiments," remember that nature distributes them liberally around us; not a meadow, not a pasture field, by river's bank, or on hill side, but what has plants eminently condimental in flavour and action. One lesson our natural pastures teach us, that variety is an element in food, a lesson we must say, not always taken by feeders; it is, however, worth thinking over at least, if not worthy of being followed. The feeder who varies the food he gives to his animals, will, we venture to say, have a great advantage over him who does not attend to this.

POINTS TO BE ATTENDED TO IN THE FEEDING OF COWS.

We have still one or two points of importance to take up, before dismissing this important part of our treatise. And the first of these, is the importance of regularity in feeding. If the best results are desired, this must be scrupulously attended to; as if neglected, the animals get restless and uneasy, while waiting for their food, if the time be past at which they are accustomed to be fed—and cows soon get to know the times and the seasons—and as we have already pointed out, an uneasy cow cannot be a good milker. The number of times a day at which cows should be fed, is a much disputed question; space will not allow us to go into all the *pros* and *cons;* much will depend upon circumstances, and the feeder will have to pay attention to these, and regulate his proceedings with judgment accordingly. A good supply of pure water should be secured, and it is another disputed point, whether the cows should have a constant supply of water in their troughs, to which they can go whenever they may desire; or whether the water should be supplied at intervals. There is much in favor of the natural mode, which is the first.

SUMMER FEEDING OF COWS.

We will now conclude with a few words upon summer pasturing of dairy cows. If the best results are wanted from pastures in the summer, when the feeding value of the grass is at its maximum, eating down should not be carried out for too long a period in the autumn, not at all practised in the winter, and not so early begun to in the spring or summer. The increase in the value of the grasses of pastures may be secured further by making the animals themselves add to it by the value of the manure which they yield when depastured. This will be best done by giving the stock a portion of oilcake each day. Indeed, we believe this to be truly the best, and, in the long run, the most economical. For not only are the animals themselves the better for this treatment, but the grass is much increased in value by the extra richness of the manure, so that more animals can be kept on the same land; and further, as the period of fattening stock is shortened by their more rapid development, they can be removed more quickly, thus making room for others. The fattening of the depastured stock will also be hastened by providing shelter sheds, into which the animals can go during cold rainy weather; and during hot and sunny weather, when the "plague of flies" comes so relentlessly to the torment of the poor animals. Considering how well established the fact is that quiet is inducive of good and rapid development in fattening stock, it is surprising to find so little attention to providing means by which it can be secured in the depasturing of stock. Where summer soiling, that is confining the cows in the house, and feeding them upon cut grasses, &c., &c., is aimed at, care is necessary in order to obtain the best results from the system, which has many practical advantages to recommend it to the notice of the dairyman. The cut food should be given frequently and in small quantities. Frequently, because cows while naturally pastured eat frequently, with intervals of rest and chewing of the cud; in small quantities, because the animals, when supplied with too much, frequently pull it out of the manger and stamp it under foot, or it is breathed upon and becomes rapidly spoiled. The cut green foods should be supplemented with other foods, as oil-cake meal mashes, and the like. Exercise for a short period should also be given to the animals in the coolest part of the day, so that they may not be tormented with insects.

INFLUENCE OF FOOD UPON MILK AND BUTTER.

In Chapter Sixth we have drawn attention to the importance of good breeds in the dairy cow as influencing her productive powers. Recent researches and experiments have shown that this is doubly important where the making of butter and of cheese is the object of the dairyman; for one quality of the milk as regards its butyraceous richness is apparently dependent more upon the breed—the butter breed, as it is termed—then upon the quality of the food, and in the way in which that food is given. A large number of experiments have recently been made to test the influence of various kinds of food, and certainly go against the popular notion, that the richness of the butter is dependent upon the food given to the cow; but the question they open up is well worthy of patient investigation, for much of a practical character depends upon its correct solution.

SPAYING OF COWS.

The operation of "spaying" dairy cows—that is removing the ovaries so as to prevent them bearing young—has been for long practised with great success on the continent, as a means of keeping up their milk producing powers. Authorities in this country also strongly recommend it. The mode of operating originally carried out, was to some extent a dangerous one, hence the prejudice which arose on the subject; but now the operation is very simple, and rarely attended with inconvenience to the animal. Whether the operation should be done in the case of farm dairy cows who are fed and brought up, in what may be called the natural system, may be and is by some disputed; but all are agreed that the operation is eminently useful in the case of town fed dairy cows, which are confined perpetually to the house.

CHAPTER FOURTH.

THE DAIRY AND DAIRY UTENSILS.

THE DAIRY.

The position and site of the dairy with relation to the cow-house, requires to be considered with great care. At first sight, the best position would appear to be that which placed the dairy as near the cow-house as possible, so that no time should be lost in carrying the milk from it to the dairy. But there are some very important considerations which modify this; and first, that which bears upon the qualities of the milk put up in the dairy; for it should be known and remembered, that milk is exceedingly liable to be tainted by the presence of bad smells, and these are almost sure to exist more or less decidedly in the immediate neighbourhood of the cow-house. Where circumstances will permit, we would strongly recommend the dairy to be an isolated building; or if not, rather to be placed as part of the farm-house, than of the farm-buildings, there being less chance of bad smells arising from the house than the farm-buildings. Another advantage of an isolated dairy, is that greater facilities will be afforded for giving it the proper aspect; securing a good foundation, so as to keep its interior as free from damp as possible, and to secure good ventilation. If made an isolated building, it will be well to provide accommodation for boiling water and for washing the dairy utensils, thus saving the labour of doing this work in the farm-house, together with the removal of the materials and utensils which this would involve. The boiling and washing-house will require, however, to be as far apart from the milk-house as possible; and the site should be so arranged, that the milk-house will have a north or north-east aspect, the boiling-house and wash-house being placed on the southern side; with the churning and cheese-house placed behind them. The site should be carefully drained; this being best done by surrounding it with field drains, to be placed at a depth of at least four feet, and conveying the water to the regular outfall. The walls, if of brick—which is the best material—should be double, or hollow; and the footings should be placed upon a layer of concrete at least twelve inches thick; the rising of damp in the walls will be all the more effectually prevented if the concrete of the footing be extended outwards at least twelve inches beyond the outer line of wall, and coming up to the ground level. This method will be found much more effective in keeping the walls dry, and in conjunction with the drainage of the whole area of the site above recommended, than the mode usually adopted of placing a course of slates or of sheet lead above the footing course of bricks.

DAIRY FLOORS.

By far the best floor for the dairy rooms is Portland cement concrete; this, if properly done, presents a surface as hard and smooth as stone, and with the immense advantage which stone flagging does not possess, and that is, the absence of chinks or joints, in which water and dirt are so apt to collect. A further advantage which Portland cement concrete possesses, is that it dries rapidly after being washed, as it possesses non-absorbent powers to a remarkable extent. For these reasons, we would strongly recommend the concrete to be used in the foundations of the floors of the dairy, in preference to any other material generally used. The floors of all the apartments should be made slightly convex, rising gradually from the sides and ends to the centre; by this arrangement, when the floors are thoroughly washed, the water drains off at once to the sides and ends. At these points, open surface grooves or drains are made which lead off the water to the drain outside, which should communicate with the proper outfall. These side grooves should be at least five inches wide, and not deeper than one inch and a half in the centre. The bottom of these side drains should be half round, or concave, not rectangular with sharp sides; and the junction of upper side lines with line of floor should be rounded so as to take off the arris or sharp edge. These side drains should be placed parallel to the walls, and at a distance therefrom of six or eight inches, measuring from the inside line of wall to the centre of drain, this floor space between wall and drain being made to slope from the wall to the drain. The drains throughout their whole length should have a gentle slope from one wall of the dairy to the other, the outlet to the carrying off drain being made at the lowest part. By this arrangement of floor with side drains, the whole surface will be washed and swilled with pure water, with great care and despatch, and the concrete floors will be found to dry rapidly.

We are aware that there are those who maintain that water should never be used in the cleansing of dairy apartments, and that, therefore, the above recommendations should not be attended to. But, a due consideration of what thorough cleansing is, will shew the necessity of using water—that, however, being pure, and abundant in quantity—if this thorough cleanliness is required, as required without doubt it is in the dairy apartments and in the dairy utensils. The great objection to the use of water in cleaning out dairies arises, not merely from the floor as a rule being badly constructed, but from the habit of using so little water that it gets rapidly contaminated, and is not fit for cleansing purposes. Let abundance of water, and that as pure as possible, be used, frequently changing the water, and finally swill the whole floor with clean water, then carefully mop the surface and dry wipe it, and there need be no fear of damp or bad results arising, provided the floor be properly constructed as we have recommended above. When the dairy apartments are thus properly and thoroughly cleansed, they may be kept for a long time clean by moist and then dry wiping and dusting, without the use of water in large quantities.

The inside walls of the milk-room should be lined up to a height of five feet from floor level with white glazed tiles, and above this lathed and plastered; or if the expense of the tiles be objected to, the whole may be lathed and plastered. All corners, and the junction of wall with ceiling, should be rounded off, to prevent as much as possible the formation of parts on which dirt can lodge; for the same reason, no mouldings or projecting parts should be made, and the window and door architraves should be flush with the surface of walls.

VENTILATION OF THE DAIRY.

The ventilation of the milk-room should be specially provided for, the great points to be arrived at being a continual change of air in the interior, with the maintenance of a temperature as equable as possible. This latter point will necessitate special arrangements, adapted to the summer and winter arrangements. We shall take up these in their order; and first, as to the ventilation of the milk-room. Ventilation includes two essentials; first, a means for providing regular supplies of fresh air; and second, for withdrawing it from the interior. The supply of fresh air should be carried out by a combination of two methods; special apertures made in the external walls near the floor level, and a special arrangement of the windows. The air apertures near the floor should be covered outside with iron gratings, to admit the air, while preventing the access of vermin, and supplied with hinged valves, which can be opened and shut according to circumstances, so as to increase or lessen the supply of air to the interior. The position of the milk-room with relation to the other rooms of the dairy, as the churning and the cheese-room, and the scalding or washing-room, should be such that air can be admitted on three sides of the room, so as to ensure as equable a supply of air all over the interior of the milk-room. The means adopted for ensuring a supply of fresh air by the windows are of very simple character, namely, making each window in halves, the lower and upper halves being hinged to a bar stretching horizontally across the centre of the window frame; the lower half being hinged so that it opens inwards and upwards, the upper half inwards and downwards. By adjusting the opening of the two halves, the fresh air may be admitted in any required degree of volume, and in any direction—upwards towards the ceiling, and downwards towards the floor. So much for the admission of fresh air; for removing the used air, there are a great number of plans open for choice. The best arrangement we have yet seen, was described recently in a leading agricultural journal. In this the ceiling is proposed to be made up of narrow fillets, so placed that spaces are left throughout the whole surface of ceiling; through these spaces the air passes, into the space between the inner ceiling and the outer roof, in which are placed ventilators with valves, which may be opened and closed as desired. If a ceiling be dispensed with, and an open roof adopted, the roof will require to be double, that is, a hollow space between the inner and outer boarding; this will tend to keep the temperature of the dairy more equable, than if the boarding and slates are the only covering. The double roof is simply made by lining the inner side of rafters with inch boarding tongued and grooved. The inner surface of boarding will be all the better if papered with a glazed white paper. The door to the milk-room should be double, or an outer porch may be given to it.

WARMING OR HEATING, AND MILK SHELVES OF THE DAIRY.

To maintain the necessary temperature in the milk-room, in the winter, it will be necessary to have means of warming the air. By far the best method of doing this, is to employ a hot-water apparatus. By the use of this, the temperature can be altered with all necessary accuracy, which cannot be done when hot-air flues are used. Stoves, being dusty, and giving out hot burned air, should not be used. To reduce the temperature in the summer time, ice should be employed; an authority recommends the window blinds to be wetted, by squirting water on them, the evaporation of which produces cold and reduces the temperature. In improved dairies, the milk shelves are made in the form of troughs, and made to slope gently from one end of the milk-room to the other; along the troughs cold water flows, and by which the milk vessels are partly surrounded, warm water being employed in winter.

The best material of which to make the milk shelves is cast iron, with grated surfaces; these are easily kept clean, and the gratings allow of currents of air to pass upwards over the milk vessels. If cast iron be objected to, marble or slate may be used; wood is the worst material, as it is difficult to be kept clean, and sooner or later acquires a taint. If it be employed, however, it ought to be hard wood, with a fine close grain, such as sycamore. All shelves should be placed quite clear of the walls, and in no case coming in contact with them; a space being left between the inner edges of shelves and the walls, the shelves can be thus much more easily cleaned, and a current of air can find its way on both sides of the shelves.

MILK VESSELS.

A great deal has been written and said about the milk vessels, their material and the best form. As to material, glass is undoubtedly the best, and the easiest kept cleaned; the objection, however, being the cost of the vessels made of it, and the ease with which they are broken. Earthenware, glazed inside, is an excellent material; so also is iron, well tinned. The vessels, of whatever material formed, should be of pretty large diameter—not less than a foot across, but better if fifteen or eighteen inches—and shallow, the depth not exceeding six inches. The vessels for storing up the cream—if the butter be made from cream in place of the whole milk (see next chapter on Butter Making)—should be of earthenware glazed inside, of the best quality obtainable, and be of capacity sufficient to contain seven to eight gallons. The cream vessels are deep, not shallow like the vessels in which the milk is set up to cream. Where the quantity of milk is large, milk coolers will be of great use. There are many forms of these, several being of American invention. The simplest form is that of a trough, longer than broad, and shallow; the material of tinned iron. They should be provided with means by which the milk can be easily withdrawn from their interior; and as they are fixtures, water pipes for both hot and cold water should be attached to them, by which they can be effectually and quickly cleansed.

CHURNING, CHEESE-MAKING, STORE, AND SCALDING ROOMS.

In a dairy, a separate room for churning and working up the butter will be a great convenience. The only fixtures in this will be the "table," in which the butter is worked and made up; and shelves, on which to place the butter when finished. The "table" will be best if made of marble, slate being the next best. An abundant supply of good spring water should be within easy reach of the table. The cheese-making room is fitted up with the vats and the cheese presses. The store-room should be adjoining. The scalding-room, or room for washing the utensils, should be further from the milk-room, or placed in an entirely isolated building. It must be carefully ventilated, and provided with an ample supply of water, with means for boiling the same, and with vessels for washing the utensils, and with shelves. A verandah outside the building will be of great service, under which the vessels when washed may be put to dry and to be aired. A deep verandah also placed round the milk-room, will serve usefully to maintain an equable temperature in its interior. An ice-house may be deemed a refinement in dairying; but if it can be had, it will be found not only a great convenience, but to be an economical addition to the dairy buildings.

CHAPTER FIFTH.

BUTTER MAKING.

CONSTITUENTS OF MILK.

THE yield of butter from milk varies much, according to a variety of circumstances, such as the breed of the cow, the nature of the food upon which it is fed, the way in which that food is given; the mode of housing, the care and gentleness with which the animal is treated; and upon certain physiological circumstances, which it is not always easy to determine, and of the nature of which we unfortunately are yet in great ignorance. The yield—and unmistakeably the quality—of the butter is greatly influenced by the way in which the milk is treated, both before and during the process of churning. Butter is made up of—on an average to the hundred parts—of 82¾ of pure oil or fat; 2½ of casein or curd, and about 15 per cent. of water, containing a little salt. The oleaginous particles of milk or cream are present in the form of globules, these being coated, so to say, with the albuminous or nitrogenous portions, in the form of casein. The globules vary in size, and according to the proportion of their presence is the richness of the butter which may be made from the milk. They are of less specific gravity than the fluid portion of the milk; they therefore rise to the top, and form there. This is allowed to remain quiescent, a scum more or less dense is formed, which is the cream.

The cream contains, besides the oleaginous globules, a considerable proportion of the salt, and the sugar of the milk, together with the casein which envelopes the globules of oleaginous matter. These globules in the act of churning are set free by the agitation of the mass breaking up the envelopes of the casein. This indicates that a certain time will be required in the operations of churning, before the casein will be separated from the oleaginous portions, or in other words, the butter. Hence, will be seen the doubtful results —to put the matter in the mildest way—of the operations of those churns which are advertised as possessing the great merit of bringing the butter quickly, some claiming to be able to do this in "five minutes." We do not believe, and for the reasons above stated, in quick churning; all good dairy managers admit that to get the best butter, the operation of churning should be a comparatively slow one, from three quarters-of-an-hour, up to two hours—an hour being a fair average. This will, however, vary according to the season; the operation being a much more tedious one in winter than in summer. When the butter is separated from the cream, the buttermilk remains, containing the casein, and salt, and sugar; although a proportion of these is taken up, as we have seen, with the butter. The greater the proportion of casein left in the butter, the poorer is it in quality, and the more quickly will it become rancid.

PROPORTION OR YIELD OF BUTTER IN MILK AND CREAM.

The yield of butter varies very much, as we have already stated; a good average quality is 14oz. from a quart of cream, which cream is obtained from twelve quarts of milk. Some feeders get a much larger proportion than this; as high as 25oz. of butter from one quart of cream; others get much lower, some as low as 8oz. from a quart. The richness of the milk varies, as a rule, according to the season; the summer milk is supposed to be the best for cheese, the autumn milk for butter. The milk also varies in the course of the day in richness, the morning milk being always richer than that got from the cow in the evening; again, the milk at time of milking varies, the last drawn portion being always the richest; hence, the necessity for thoroughly milking the cow to the last drop, and hence also the rule, which some experienced dairymen adopt, of keeping apart the morning's milk—the richest, as above shown—from the evening's milk, which is the poorest, the object being to have a superior class of butter; for general purposes, there is, however, no distinction made between them.

When milk is sold off the premises, it is of great importance that it should be sent out to the consumer as sweet as possible. This can only be done by cooling down the temperature of the milk immediately after it has been withdrawn from the cow. This is rarely attempted by proper apparatus in this country, but it is so to a large and successful extent in America. The importance of the process will be seen from a simple statement or two. When milk is exposed to the air, the sugar which it contains is rapidly oxydized, and lactic acid is formed; this formation, singularly enough, takes place with greatest rapidity at the temperature at or about that at which the milk is taken from the cow. The moment the formation of lactic acid begins, the milk begins to sour, the rapidity of the process depending upon the temperature. Milk, when cooled down immediately after it is drawn from the cow, can be put away in large vessels and be transported to a distance without injury; it keeps long, it is sweeter, and this in consequence of so little, if any of the milk-sugar in it turning to lactic acid. Cream from cooled milk rises more rapidly than when not cooled, and although kept —as it may be for convenience, and to prevent access to it of dirt, dust, &c.—in close vessels with air-tight covers, the cream rises with facility, and the milk remains sweet and pure. We believe all the milk coolers yet introduced are of American invention, and vary in their arrangement and construction. The simplest form resembles a "still;" the milk descending through a coil of piping, which is placed in a vessel and surrounded with cold or iced water, kept changing as it gets warm.

TREATMENT OF THE MILK AND THE CREAM FOR CHURNING.

Before taking the milk to set up in the milk-room, it should be carefully strained, to keep back impurities, as hairs, &c. The presence of hairs in butter is very disgusting to the majority of consumers; always a sign of bad management, it is sure to lower the price. The atmosphere of the milk-room, as stated in a previous chapter, requires to be of the utmost degree of purity attainable; so liable is milk to be tainted by bad smells, and to acquire flavors which will ruin the quality of the butter. The most scrupulous cleanliness, both of the milk-room itself, and the vessels in which the milk is put up, and the churn, is demanded. All the milk vessels and the churn must, therefore, be scalded with boiling hot water, not merely warm, as some use it; and thereafter carefully rinsed out with pure cold water, and set up to dry in the open air under a verandah, so as to be sheltered from the weather. It is not possible to excel in butter making, unless the most perfect cleanliness in every department is secured. From the readiness with which milk acquires a taste, the food upon which the cow is fed will influence the taste of the milk, and consequently of the butter. Thus, turnips are well-known to give a disagreeable flavour to the butter, when they are used in feeding, which they are generally so in autumn and winter. Various "cures" for this have been published; but we know none so effective, or rather no mode which will prevent the taste of turnips being imparted to the milk, than the practice of giving the turnips to the cow *after* she has been milked, never before, which is the almost general practice.

Butter is made in two ways, either by churning the whole of the milk as it comes from the cow, or by churning the cream; and these two modes, again, are still further varied by churning either the milk, or the cream, as the case may be, in a sweet, or in a sour, or "lappered" condition. Our experience is altogether in favour of the method of churning the cream, and that in a soured, or lappered condition.

The milk should not be allowed to stand in the milk dishes too long, under the impression that more cream will be obtained, by the extra length of time it is allowed to stand. The cream should be taken off before the surface begins to wither or get wrinkled; if allowed to remain after this begins, putrefaction will commence, and all the fresh richness of the cream will be lost, and good butter from it will be an impossible thing. Twenty-four hours, at the most, is quite sufficient for the milk to stand before being creamed, under average circumstances; to allow it to remain for three or four, or, as some do, even five days, is, as we have shown, quite an absurd thing to do. The cream should be set up to "sour," "lapper," or "ripe," in glazed earthenware crocks or deepish mugs. The cream should be put gently in, so as to prevent any of it being plashed up against the sides of the crock; if any portion does so get plashed, it must be carefully removed with a wet and perfectly clean cloth, and the part thereafter dried. On no account, should portions of cream be allowed to remain on the sides of the vessel, above the level of the proper contents; for these rapidly become tainted, and will communicate the taint to the contents of the crock. As a new portion of cream is added—at the morning and evening skimming of the cream from the milk vessels—it should be as before carefully added, and the whole well stirred up and mixed with a wooden spoon; this stirring up is necessary, as the richest part of the cream previously put in the vessel rises to the top; if this stirring be not properly performed, the cream is very apt to become rancid. It need scarcely be said, that the spoon should be perfectly clean which is used for stirring the cream. When the crocks are filled with the cream, it is allowed to remain quiet, till the process of souring is completed. The sooner the churning is done after this the better. The cream, when souring, should be stirred from time to time carefully; some say *not* stirred; but we have always experienced the advantage of stirring, the necessity for which we believe arises from the fact, which we have previously stated, that the richest portion rises to the top, so that mixing is required to make the whole of an equal consistency, which if not secured, the cream is apt to become rancid, from whey forming in the mass. The time which the cream will take to sour, will depend upon the weather; on an average, three days in summer, and five or six in winter.

CHURNING THE MILK OR CREAM.

Churning is by no means the difficult operation it has often been described. The great point to be secured is the careful treatment of the milk and cream before churning, and which we have endeavoured to explain; and the proper temperature at which the cream is put to be churned, the best being 62° Fah. In winter a little boiling water put into the churn previous to the cream being put in, and then poured out again, will frequently bring the temperature up to the required point. In summer, keeping the churn partly filled or filled for sometime entirely with water and ice, and the cream crocks also set in troughs with cold or iced water, will reduce the temperature sufficiently. In winter, if the cold is excessive, a little hot water may be put in the cream when in the churn. The churning should, on first commencing the operation, be slowly done; the speed being gradually increased, till the butter comes, or is about to come, when the speed is lessened and the churning is slowly performed; this is called "gathering" the butter. If a dasher churn is used, the "gathering" is performed by moving the dasher backward and forward, not completely turning it round, as when churning proper is performed; the butter will, when the operation is finished, be found gathered in lumps of greater or less firmness at the sides of the churn.

As soon as gathered, the butter is to be taken out, the butter-milk passed through a sieve to catch the particles of butter which are left in it—by non-attention to this, a large per centage of butter is often lost—and the churn must then be scalded with boiling water, throughly cleaned, and rinsed out with pure water, reversed and set out to dry. The butter, and butter-milk, after the churning is finished, will often present whitish flakes, or particles of what is called "dry cream." To prevent the formation of this—which is so much loss—the cream should be well rubbed through a close wire sieve before churning; this has also an excellent effect in increasing the general quality of the butter.

FINISHING AND MAKING UP OF BUTTER.

The making up and finishing of the butter for market is a process which requires the utmost care, but, like almost every point connected with practical dairying, it is one about which there is much diversity of opinion. Some will not allow of a particle of water to be used in making up the butter; while others insist upon large quantities of it as essential in the getting out the milk, which is the point to be aimed at. Some maintain that the best way to secure this is to work the butter dry, squeezing the butter out of it by the hand alone, without the aid of water. The weight of experience is certainly in favour of the method of making butter by means of water, and plenty of it, the water, of course, being as clean and of good quality as possible. Some dairymaids insist upon the benefit to be obtained by using salted water, in place of fresh, on the ground that it extracts the milk quicker. There is, however, a question which is worth while considering. Does not the repeated application of water take with it some valuable product of the butter? But whether water be used or not, one thing is very certain, that the butter must be thoroughly well worked in order to get rid of all the buttermilk, and by nothing can this be so well done as by the hand. Butter working apparatus and appliances have been introduced to get rid of the necessity of working by hand, but they have all more or less completely failed. Nor need this be wondered at, when we consider the nature of the operation, and the exquisite adaptation of the human hand, guided by human intellect to it. In the event of water being used in working up the butter, it should be repeatedly changed, so that the butter will not be worked too long with the same quantity, which rapidly gets discoloured with the compressed buttermilk. Butter is generally worked in a wooden bowl, sometimes on a marble slab, part of which is hollowed out. As the butter is finished, made up into rolls or lumps, and stamped, it is placed outside in a cool place, and in summer, lumps of ice should be placed near it to keep down the temperature. If the butter is to be salted, this requires to be done with great care. Nothing is more annoying than to meet with lumps or particles of salt mixed up with the butter. The whole of the salt should be thoroughly and equally incorporated with the mass of butter. In the matter of butter, taste differs, as in other things, as regards the degree of salting which it should have; an average quantity used by some, is 1 ounce to 1lb. of butter; for our part we prefer the salt to be given with a sparing hand, liking the fine flavour of well-made butter to that of salt. The celebrated "Kiel" butter is salted at the rate of from 8½ to 9lb. to 1 cwt. of butter. The salting should not be done at once, if the best product is desired. It is better to allow the salt to remain for a short time sprinkled on the surface of the mass, then this should be worked gently in for a short time, and then the mass allowed to lie for a period before being again worked. If the working is done at once, the butter is apt to be oily. After the butter has stood for a time, it should be worked till perfectly clear. Some add the salt in successive portions at each working. The last working must be thoroughly done, so as to expel the last particle of moisture. If the butter is to be made up in lumps, and printed for immediate sale, this should be done with neatness, as purchasers like to see a symmetrically formed and accurately printed lump. If the butter is to be packed in tubs or firkins, this should be done with great care, pressing the butter very thoroughly into the firkin, so as to allow of the formation of no hollow spaces or vacuities, and when completely filled, a clean and wet cloth should be carefully spread over the surface, and the top of this sprinkled with a good thick layer of salt. After butter is properly salted, it should be remembered that all after handling and working only deteriorates its quality. Butter is often artificially coloured. If the cows have been properly fed, and the butter properly made, this artificial colouring will not be required—if it is, annatto is the best material to be used; this should be dissolved in boiling water, and if used, used with a sparing hand—highly coloured butter never looks well.

CHAPTER SIXTH.

CHEESE MAKING.

CONSTITUENTS OF CHEESE.

As butter is made from the oily portion of the milk, so cheese is made from the casein or curd, with, of course, the retention of the butyraceous portion of the milk. Cheese, therefore, may be said to be made up of the butter and casein; and the more perfectly these are separated from the whey which carries off the water and the sugar, the higher is the quality of the cheese. The following analyses by Dr. Voëlcker shows the composition of two cheeses:—

	Cheshire.	Cheddar.
Water	32.59	30.32
Butter	32.51	35.53
Casein	26.06	28.18
Milk-sugar, lactic acid, and extractive matters	4.53	1.66
Mineral matters	4.31	4.31

CONSTITUENTS OF WHEY.

The following shows the composition of whey, having a small proportion of butter :—

Water in 100 parts	92.75
Butter	.39
Casein and albumen	.87
Milk-sugar and lactic acid	5.13
Ash	.86

CHEESE-MAKING ROOM.

In this department of the dairy working, the first point to be attended to is the keeping of the cheese-making room as dry as possible. *(See page* 41*).*

TEMPERATURE OF THE MILK FOR CHEESE-MAKING.

The temperature at which the milk should be for cheese making, or at which the "cheese should be run," as the technical phrase goes, is a much disputed point, and in some cases depends upon the kind of cheese made, some kinds requiring a higher temperature than others. At 70° to 72° Fah. the curd is neither too tender to make it difficult of handling, nor too hard to injure the quality of the cheese. When the temperature ranges from 80° to 84°, the curd becomes more firm, but it is suited for thick, not thin cheeses. For making Cheddar cheese, which has now become the most popular of cheeses, a temperature of from 85° to 88° is followed in the district in Somersetshire from which this cheese takes its name.

In summer, should the cheese be made from the new milk direct from the cow, it will require to be cooled; in winter, the reverse will be the case. In heating the milk, great care is necessary if done in a vessel placed on an open fire; there is danger of giving the milk a taste by over heating, or smoking, or burning it. The best way is to warm a portion of milk in a small vessel plunged into a warm bath or vessel of boiling water; this vessel being itself warmed by a furnace underneath, not by an open fire. If cream is used from the old milk, it should be warmed by having the hot milk poured over it and mixing the two well up; this is better than warming the cream. When new milk is used, a good authority says that it will be the better of having old milk mixed with it, say in the proportion of one fourth of the quantity. When the milk has been brought to the proper temperature, and put into the vat, the rennet and colouring—if any—must be added, and the whole allowed to remain at rest for an hour or an hour-and-a-half, till the curding or coagulation is completed. While this is going on, the whole must be carefully covered up with cloths, to keep in the heat and keep out the dust, &c.

RENNET.

The selection of proper rennet is a point of great importance; by not attending to the good quality of this, a vast deal of poor and bad cheese is made. As our readers are aware, the rennet is a liquid made by steeping in water a portion of what is called "a veil;" this being a certain part of the stomach of a calf.

The "veils" should be carefully cleaned before being salted and packed up for use. Some veils are dried, but not salted; and it is not easy to say which is the best. The great point, however, to aim at, is having the veil perfectly fresh, that is, free from taint. The "rennet," that is the liquor made by steeping the "veil," will keep for a great length of time; so that the mode of making a fresh supply of rennet for each making of cheese may be avoided, and a quantity made to last for some time, even during the whole cheese-making season. One advantage of this system is, that once having got a supply of rennet of the strength which trial shows to be the best, the results will be uniform, from always using the same solution.

The rennet skins should be soaked in cold water; some boil the water and allow it to grow cold, but this is only done, or required to be done, in the case of hard water only being procurable; some also dissolve a little salt aud saltpetre in the water in which the skins are soaked. If the halves of three skins are soaked in 1 gallon of water, it will make sufficient rennet to make about 20 cheeses of about 25 to 26lb. apiece. Much will however depend upon the quality of the rennet skins or veils. The great point in the preparation of rennet for regular working is to secure uniformity in it, each dairymaid has her own way of making proportions and regulating the strength of the rennet she uses. The liquid annatto is the best to use, as the regular degree of colouring in the make of a given dairy, which is important, can better be secured by its use than by the use of the annatto in lump. A half-ounce of the fluid usually sold should be sufficient to colour properly a 25 or 26lb cheese. Highly coloured cheese, like highly coloured butter, does not look well, and somehow or other conveys the idea that something wrong in the material is attempted to be hid by its excessive use.

THE CURD AND THE SEPARATION OF THE WHEY FROM IT.

After the milk has been properly coagulated and the "curd" formed, the next operation is the separation of the whey from the curd. On the completeness with which the whey is got rid of, depends the fine quality of the cheese. The presence of whey in the cheese causes fermentation, and the fermentation carbonic acid gas, which, trying to escape from the cheese, causes it to heave, and also changes the taste. The best way to get rid of the whey, is to see that the breaking up of the curd is done thoroughly well, not hurried over. The best "implement" to do this is the hand, and dairymaids can manipulate the curd in a much more satisfactory way than men. The finer the quality of cheese desired, the more attention should be paid to this hand-breaking of the curd. Some depend upon the "pressing" of the cheese to get rid of the whey ; but this never does get rid so effectually of it as careful hand-breaking before pressing. Another great advantage of hand-breaking, or at least carefully conducted breaking by one or other of the cheese-breaking apparatus now used in some dairies, is that the butter is left in greater proportion in the cheese, than when the breaking is hurriedly or inefficiently performed ; and of course, the greater the proportion of butter the richer the cheese. Further, the more carefully the breaking is performed, the more completely is the butter amalgamated with the curd, and the more uniform is the quality of the cheese ; and the more free from holes, and the more uniform the texture, so to say, of the cheese, the higher is its quality. In view of this, some dairy managers now advocate the allowing of the curd to become a little acid before it is broken up and manipulated. Cheeses made with acid curd—great care is of course necessary to see that the exact degree of acidity be secured—are said to be firmer and more uniform in texture, freer from holes, and of a finer flavour, and to keep much longer, than cheeses made with perfectly sweet and fresh curd.

In describing, as we now propose to do, the method employed in making a well-known cheese—Cheshire—the reader will get a fair idea of the general sequence of the process of cheese making. The milk and rennet—together with the annatto, if the cheese is to be coloured—are put into a tub at a proper temperature, and well stirred up; the tub is then covered with a cloth, to keep in the heat and keep out the dust. The curd generally "sets" in an hour, or an hour and a half. The cutting up of the curd is next done, and now generally by an "implement" called the curd-breaker, which is a thin oval-shaped hoop, with wire cutters stretching across it. This is pressed slowly into the curd perpendicularly, till the curd is quite broken up; this operation is done gently and carefully, to secure the thorough breaking up of the curd. The tub is then covered up for a quarter of an hour, to allow the whey to separate from the curd. A portion of the whey being taken out, the curd is now broken up by the hands, this being very carefully done, the curd-breaker being also occasionally used. When the curd is sufficiently settled, and the whey removed, it is drawn as well up as possible to the side of the tub, and a board perforated with holes is placed upon it, and a weight upon the board, the tub being tilted up on one side to allow of the more ready drawing off of the whey.

When the whey is removed, it is passed through a sieve to catch any portion of curd which may remain in it, which is passed into the tub amongst the curd. The weight and board are then removed, and the curd which has been under them is drawn up to one side of the tub, and the board again placed upon it;

but with a weight double that of the first weight, say 50 or 60lbs.; the tub being tilted up to allow of the whey draining off. When the weight has been applied for a quarter-of-an-hour, it is taken off, and the board removed; and the curd is cut across with a knife, at distances of six or eight inches apart, to allow the whey to escape freely. The board is again put on, but with a hundredweight upon it this time. The increase of pressure should be gradual, and be made dependent upon the compactness of the curd; otherwise, if too hastily increased, and the pressure unduly made, a portion of the butter is pressed out, and the cheese is made so much the poorer. The board and weight are next removed, the curd cut into square pieces, taken out of the tub, and broken by the hand on being passed into what is called the "thrusting tub," in which an increased pressure is put upon the broken curd by means of a screw and lever. The "thrusting tub" is provided with perforations in its surface, to allow of the whey to pass off, and to allow it to do so all the more freely, skewers are thrust in a slanting upward direction. The pressure being removed in about fifteen or twenty minutes; the curd is cut into squares of two or three inches, and the outer edge of the curd cut off, and placed in the centre of the mass, and then the pressure is again applied; the skewers being also used to clear a way for the whey to pass out from the pressed curd. After the pressure has been applied for fifteen or twenty minutes, the curd is taken out of the "thrusting tub," cut into four or five pieces, and each piece further reduced to two or three inches square, by being broken by the hand. The operations now described are repeated till the whey is pressed out of the curd, and it is ready for "salting." Before this is done, the curd is finely broken by being passed through the "curd mill," or broken up by the hand; when divided, the salt is scattered over the mass, and well mixed by thoroughly crumbling up, and breaking the curd, either by passing it through the curd mill, or mixing and breaking by hand, or by these operations combined. It is then placed in the cheese vat uniformly and carefully, finishing off the mass with a rounded top. When filled thus, the vat is put under the screw press and skewered as before; after the lapse of an hour, the pressure is removed, and the pressed mass of curd lifted out and reversed in position, the bottom now forming the top. Placed again in this position in the vat, the pressure is again put on for an hour or less; when on being taken out, the pressed mass is ready to be put under the most powerful press, in which it is kept for three days or so, being the while occasionally skewered; after which, the pressure is increased for another day to about thirty or forty cwt. The cheese is then removed to the drying or "curing room," where if not salt enough, salt is rubbed on externally; the cloths used for covering the curd or cheese, when passed through the screw-presses, should be thoroughly clean.

The salting is, by some, done entirely by rubbing the salt over the surface, not by mixing it with the curd as above described in the first instance. In salting through the medium of the surface only, when the first pressings are done, the cheese is placed upon a table, and the salt spread thinly and evenly over the surface; this is done for three days, each day twice a day, namely, night and morning, the pressing being carefully done, so that the pressure be uniform over the surface of the cheese. The pressure should be gradually increased, and no salt applied to the cheese before the last pressure. Some good cheese makers steep the cheese, after it has received its last pressing, in a salt brine, two days being the time during which the brine is applied. After this the cheese is taken, washed with warm water and wiped dry, and then transferred to the press room.

A most important point to be attended to in the management of a cheese-making dairy is, that regularity in every department be introduced, and that no hurrying over the work—which regularity alone will secure—be permitted. Cheese will not be properly made if made in a hurry: for this reason, in some dairies cheese making is not carried on in the afternoon, as from the desire of the work people to get "soon through" with their work, that work is "scamped" and carelessly done. The materials used, as rennet, annatto, and salt, should also be the best of their kind.

In pressing, the great point to be attended to is that the pressing should be done lightly at first, and the pressure only gradually increased. It is a great mistake to press the curd too much at first; this is done under the impression that the heavy pressure gets rid of the whey much more quickly. It may do this, but it does something more, and that something is that which should not be done; it is apt to squeeze the butter out, and the heavy pressing at first, puts a hard skin on the cheese, which hinders the proper drying and deteriorates the quality of the cheese. The pressing should, therefore, be gently done at the beginning, and it should be gradually increased till the proper pressure is reached and the operation ceases.

The drying or curing of the cheese requires to be carefully done. The room must be perfectly dry and warm, and the ventilation as perfect as possible, that is, the air should be kept continually changing, but without draughts, which are very prejudicial; the temperature should be keep as uniform as possible. When placed in the curing room, the cheeses should be frequently turned over, and when perfectly ripened, removed to a cooler room, as if kept long in the warm room the cheeses loose rapidly in weight. If properly constructed and warmed, the cheeses will be ripened enough if kept in the curing-room for five or six weeks.

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